

Aerial Tools for Professional Biologists

When the glacial lacustrine layer 27 m below the perimeter embankment of the Mount Polley Mine Tailings Storage Facility failed, it caused a section of the embankment to breach, releasing outwash materials into the Hazeltine Creek corridor. The area was immediately closed to public access for months because of safety concerns. Extensive work was carried out to control erosion and reconstruct the creek, but this work was invisible to the public who could not see that a major effort was underway. Just the creek foundational work required >25,000 40-tonne truck loads of rock and creek-building materials. A drone proved to be a valuable communication tool that allowed the public to see the rehabilitation work as it progressed, in bird's eye high definition (HD) video and high resolution still photos. The drone could get closer and fly lower than a helicopter could, and at a fraction of the cost.

Modeling and quantitative tools

Drones, or Unmanned Aerial Vehicles (UAVs), have become small, lightweight, easy to pilot, and inexpensive to buy and operate. For biologists, they offer not only a flying camera to help communicate their work, but are also quantitative tools. While it seems like “witchcraft” that a series of 2-dimensional photographs can be digitally processed into 3-D models, photogrammetric software can do this with ease, even allowing a quantification of the dimensions and volume of various features. Depending on the payload capabilities, UAVs are also capable of LiDAR and other surveys. At Golder Associates, one of our rock mechanics engineers recently designed and built a specialized underground drone to inspect old mine workings where human entry would be dangerous (photo on top of next page).

Proper use by biologists

Needless to say, UAVs can also be used for improper purposes, such as by hunters to locate game – a practice recently banned by specific amendments to the provincial *Wildlife Act* – and UAVs can pose significant safety hazards when used recklessly. Social media is full of videos in which drones have clearly been flown in areas where they could cause injury, property damage, or human-occupied aircraft strikes. The use of UAVs for commercial purposes, whether that use is direct or indirect, is regulated by Transport Canada under the same legislation that regulates aviation safety (Canadian Aviation Regulations). This is important for the College because members are required to follow all applicable laws when

carrying out their work or face professional discipline in addition to any fines. Fortunately, the rules surrounding UAV use are not difficult to comply with, and our members' continued ability to use these tools depends on taking the legal and professional responsibilities seriously.



Photo: Trout spawning redds in the Columbia River. Golder Associates Ltd.

Regulatory requirements and exemptions

Regulation of direct and indirect commercial UAV use depends on the type of equipment being flown and the location where it is flown. Transport Canada has provided an exemption for commercial operators using equipment with a flying weight under 2 kg. A Special Flight Operations Certificate (SFOC) is not needed if the requirements of the exemption are strictly followed – including having the correct kind of insurance coverage. Those requirements are detailed on the [Transport Canada website](#), but the main considerations are that you must fly more than 5 nautical miles (nm) from the nearest aerodrome ([check the NAV CANADA aeronautical maps](#)) and from the nearest built-up area (anything more than a farmstead).

In the early stages of Golder's drone program, we thought that this would be sufficient for many of our project locations, but in many cases this requirement was very restrictive, either because many old airstrips and heli-pads were closer than 5 nm, or there was a small village nearby. We now fly under a SFOC from Transport Canada, and it greatly expands our flying

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areas in restricted airspace near aerodromes. Our pilots also have their Radio Operator's Certificate - Aeronautical (ROC(A)), which further broadens the flight space they can operate in because of the ability to communicate with aircraft in the event of an emergency. The SFOC details the requirements that must be met – the list is too long for this article – and it also requires that a company with an SFOC have a management structure in place for drone operations. None of these requirements are insurmountable, and they are outweighed by the numerous benefits of using drones.

At the time of writing, Golder has 7 pilots approved for commercial flight operations and 9 in our training program. Before training on the more expensive UAVs, we require several hours of logged flight time and competent performance of a series of manoeuvres with a trainer drone, which is essentially a “toy” that sells for about \$80. These exercises teach trainee pilots 3-D control orientation throughout several flight skills. When starting out, crashing is certain, so this training has proven to make a drone program more affordable, particularly because the \$80 units are difficult to break. It's important for RPBios to note that any use of a drone is considered commercial use. One key consideration related to commercial UAV operation is the need to obtain permission from the landowner where take-off and landing occurs. Some industrial operations will have their own rules on UAV use, but in any event, make sure that operations staff know about and have approved the drone use. Your company or organization should consider additional practices that it wishes to apply. For instance, if Golder pilots are flying in an area where machines are operating, radio contact is established with equipment operators so that they are not distracted from safe operation of their machines. For normal commercial flights, our pilots are required to stay away from roads with traffic so that drivers are not distracted. Safety is as much about not causing harm to others as it is about not injuring yourself.

The capabilities of UAVs have been increasing exponentially and they offer the professional biologist new solutions that were previously unavailable. Admittedly, they are also fun and can unleash the “inner child”, so as professionals we should use them well, but also use them right. 

Respectfully submitted,
Lee Nikl, RPBio, Golder Associates



Photo: Ryan Preston, Geological Engineer, Golder Associates. Designed and built the underground drone. Golder Associates Ltd.

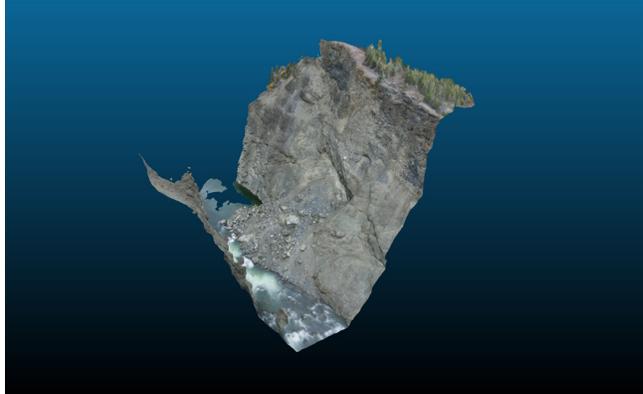


Photo: 3-D model of a landslide partly blocking a river canyon in Northern BC. The UAV was essential to the study, providing a fast, accurate, and cost effective solution to obtain necessary data. The UAV allowed access to an area that was not otherwise accessible by foot, boat, or helicopter, and allowed us to inspect a highly unstable area that would have been too dangerous for people to approach. Golder Associates Ltd.